

TITLE OF THE INVENTION

IMAGE CAPTURING DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

5 This application is based upon and claims the
benefit of priority from the prior Japanese Patent
Application No. 2000-201161, filed July 3, 2000,
the entire contents of which are incorporated herein
by reference.

BACKGROUND OF THE INVENTION

10 1. Field of the Invention

The present invention relates to an image
capturing device and, in particular, to the technique
of performing image processing on a desired object,
that is, a desired subject, on the basis of image
15 information of a captured image.

2. Description of the Related Art

In the case where a still image is to be obtained
from an image taken by a digital camera in an attempt
to perform image processing on a desired object such
20 as a person, an external device such as a personal
computer has conventionally been used by which it is
processed by dedicated software.

In the above-mentioned conventional technique,
however, the image processing is performed by an
25 external device such as a personal computer, etc., and
it has not been possible to perform image processing of
a desired object in real time. For this reason, there

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of kinds of image processing and each image processing can be selected for each object.

In the image capturing device, it is preferable that the extracting means has designating means for designating the desired object.

Preferably, the image capturing device further comprises displaying means for displaying the captured image and the displaying means can display the object information extracted by the extracting means.

Preferably, the image capturing device further comprises designating means for designating the desired object from the image displayed on the displaying means and setting means for setting an imaging condition to the desired object designated by the designating means.

Preferably, the image capturing device further comprises replacing means for replacing a certain still image by a moving image on the basis of a moving image located before or after the certain still image in a time-base direction, the replaced moving image being outputted to the first compression means.

Preferably, in the image capturing device, the recording means can record image data on a different recording medium in accordance with the kind of image.

Additional objects and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects

and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out hereinafter.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

5 The accompanying drawings, which are incorporated
in and constitute a part of the specification,
illustrate presently embodiments of the invention, and
together with the general description given above and
the detailed description of the embodiments given below,
10 serve to explain the principles of the invention.

FIG. 1 is a view for explaining an outline of an embodiment of the present invention;

FIG. 2 is a view showing, as a model, a processing operation on a CCD when respective kinds of processing are done in a still image capture on the embodiment of the present invention;

FIG. 3 is a block diagram showing a major arrangement of an image capturing device according to the embodiment of the present invention;

20 FIG. 4 is a view showing an outline of the
operation of the image capturing device of the present
invention;

FIG. 5 shows a flow of the processing on the image capturing device of the present invention; and

25 FIG. 6A is a view showing an outline of a flow of
processing in an object extracting mode on the image
capturing device according to the embodiment of the

present invention, FIG. 6B is a view showing an outline
of processing in a background-blurring mode on the
image capturing device according to the embodiment of
the present invention, and FIG. 6C is a view showing
an outline of a flow of processing in an adaptive tone
curve correction mode on the image capturing device
according to the embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

An embodiment of the present invention will be
described below with reference to the accompanying
drawing.

FIG. 1 is a view for giving an explanation about
the embodiment of an image capturing device.

In a digital camera, a moving image is taken at
a rate of, for example, 30 frames/sec. (processing a).
The moving image thus taken in the digital camera is
compressed by predetermined compressing and coding
processing (here, MPEG compression processing). In a
moving image recording mode, compressed moving image
data is recorded on a recording medium, such as a hard
disk. In the MPEG compression processing, the
compression of the image is achieved by utilizing
interframe and intraframe correlation information.
The information about an object, that is, a subject,
included in the moving image is extracted from the
course of the compression processing (processing b).
In an example illustrated, the information of

aircraft, automobile, background, etc., is extracted. The following processing can be done by utilizing the extracted object information.

Processing c and processing d extract only
5 a designated object and set the image capturing condition, etc., as will be briefly explained below.

On an LCD image screen (constituting a finder) displaying the moving image, designatable objects are displayed in a visually recognizable way, for
10 each object, on the basis of the extracted object information. For example, the designatable objects are displayed in a visually recognizable way by an enhanced outline, flashing ON/OFF, change of display colors, etc. The photographer selects an object extracting
15 mode and designates one or more desired objects from those objects included in the moving image displayed on the LCD image screen. For example, the photographer designates a desired object on the LCD by using a marker. Here, it is assumed that the aircraft as
20 indicated by a broken line is designated. After the desired object has been designated, the setting of the image capturing condition, such as an AE (auto-exposure) and AF (auto-focusing), is automatically made to the designated object by depressing a release switch
25 and only a designated object is taken as a still image. The thus taken still image data is compressed by a predetermined compressing and coding processing (here,

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such processing is done on the remaining portion (in FIG. 2, a background portion).

In the embodiment of the present invention, as set out above, the information relating to an object is extracted from the moving image information obtained in the compressing and coding process and desired image processing (signal processing) is selectively performed only on the extracted object. For this reason, the image processing can be effectively performed only on a desired object in real time. It is, therefore, not necessary to perform image processing, like the prior art, with the use of an external device such as a personal computer and it is possible to readily confirm a still image, at its capturing location, on which desired image processing is done.

(Structure)

FIG. 3 is a block diagram showing a structure of a main section of an image capturing device according to the embodiment of the present invention.

The basic structure of an image capturing section is similar to an ordinary digital camera and comprises a lens unit 11 (image lens, diaphragm, shutter, etc.), a CCD (imaging device) 12 for performing photo-electric conversion of a subject image from the lens unit 11, an analog processing circuit 13 for performing amplification, A/D conversion, etc., of the photo-electric conversion signal from the CCD 12, a drive

the moving image from the information obtained in the course of the compression processing by the MPEG processing section 19.

The digital processing circuit 17 performs various kinds of processing as will be later described, by passing various kinds of information to and from the memory section 18, MPEG processing section 19, JPEG processing section 20 and object detecting section 21, etc.

The digital processing circuit 17 performs various kinds of processing, such as the object extracting processing and adaptive tone curve correction processing, on the basis of object information extracted in the course of the compression processing by the MPEG processing section 19. The digital processing circuit 17 performs various kinds of signal processing, such as the brightness level and color tone conversion, white balance adjustment and gamma correction. Further, the digital processing circuit 17 also performs processing for decompressing the compressed image data. The digital processing circuit 17 feeds the information on the brightness, frequency, etc., of a selected object back to the lens unit 11 through the CPU 15, etc. The image capturing condition of the exposure, focusing, etc., relating to the selected object is optimized based on the fed-back information. When the moving image and still image are

both captured and recorded, the digital processing circuit 17 performs interpolation processing on a dropped frame, as will be described below, with the use of the correlation information on the moving image obtained in the compression processing and this is done in order to avoid an unnatural display resulting from such a dropped frame.

The output of the digital processing circuit 17 is connected to a D/A conversion circuit 22. The image is displayed on the LCD 23 on the basis of the signal D/A converted by the D/A conversion circuit 22. The LCD can display either of an image obtained by skipping over pixels of the captured moving image and an image obtained by applying decompression processing to the compressed moving image. A marker is also displayed on the LCD 23 to designate an object.

Further, the digital processing circuit 17 can transmit and receive information to and from an HDD 24 and other recording media 25 (FD, memory card, etc.). By the selection of the compression rate and selection of the recording media, the image data is recorded on the HDD 24 and other recording media 25. The image data of a greater data amount, such as the moving image and lower compression-rate image, is recorded mainly in the HDD 24. The image data of a lower data amount, such as a still image, is recorded mainly in the above-mentioned other recording media. By recording the

image data on a predetermined recording medium in accordance with the type of image, that is, in accordance with the moving image, the still image or the type of image processing, it is possible to control the different type of image data for each recording medium.

(Operation)

FIG. 4 is a view briefly showing the operation of the present embodiment.

Usually, the moving image is obtained at a predetermined rate of, for example, 30 frames/sec., and displayed on the LCD image screen (finder screen) and the moving image data compressed by the MPEG processing is recorded on the recording media, such as the hard disk. Further, the object information included in the moving image is extracted from the information obtained in the course of the MPEG processing. In order to allow a designated object to be captured under the best conditions, the information based on the extracted object information is fed back to the lens unit (imaging lens, diaphragm, shutter, etc.).

In the case where the still image is obtained, it is captured by the release operation when needed. After desired signal processing (object extraction, background blurring, adaptive tone curve correction, etc.) has been performed on the captured image, the JPEG-processed still image is recorded on the recording

medium.

When the still image is captured, the image capturing conditions are set in a different fashion from when the moving image is captured. For example, an optimal image capturing condition is set to a designated object. It is, therefore, not possible to use the image data obtained as a still image directly as one frame of the moving image. In order to avoid a frame-dropped moving image, the dropped frame is interpolated with the use of correlation information obtained in the course of the MPEG processing. Stated in more detail, the dropped moving image frame is interpolated by utilizing correlation information of those moving image frames before and after the dropped frame. Even if a still image is captured in the midst of capturing a sequence of a moving image, the dropped frame of the moving image is interpolated by the above-mentioned processing and it is possible to obtain a natural moving image.

FIG. 5 is a view showing a flow of processing relating to the operation of the image capturing device of the present embodiment.

A power supply is turned ON and the CCD is driven (S1) and a moving image is continuously captured so as to obtain object information from the MPEG information (S2). The obtained moving image data is compressed and coded by the MPEG processing (S3). The compressed

object (S12) and, with the use of the selected tone, processing is done on each object (S13).

The image data of the thus obtained still image is compressed and coded by the JPEG processing (S14) and, in the case of a non-compressed mode, not being compressed, it is recorded on a selected recording medium (S15, S16).

FIGS. 6A, 6B and 6C are views schematically showing a flow of processing in respective modes (object extraction mode, background-blurring mode and adaptive tone curve correction mode) relating to the operation of the present embodiment.

In the object extraction mode, out of the image data of a captured still image, only a signal of a designated object is subjected to digital processing on the basis of the object information obtained by the MPEG processing and the other signal is discarded without being processed. On the designated object, predetermined digital processing is performed and it is displayed on the LCD and recorded on the recording medium on the basis of a signal on which the digital processing is done.

In the background-blurring mode, out of the image data of a captured still image, only a background signal is blur-processed based on the object information obtained by the MPEG processing. The blur-processed background signal, together with

shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalents.

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